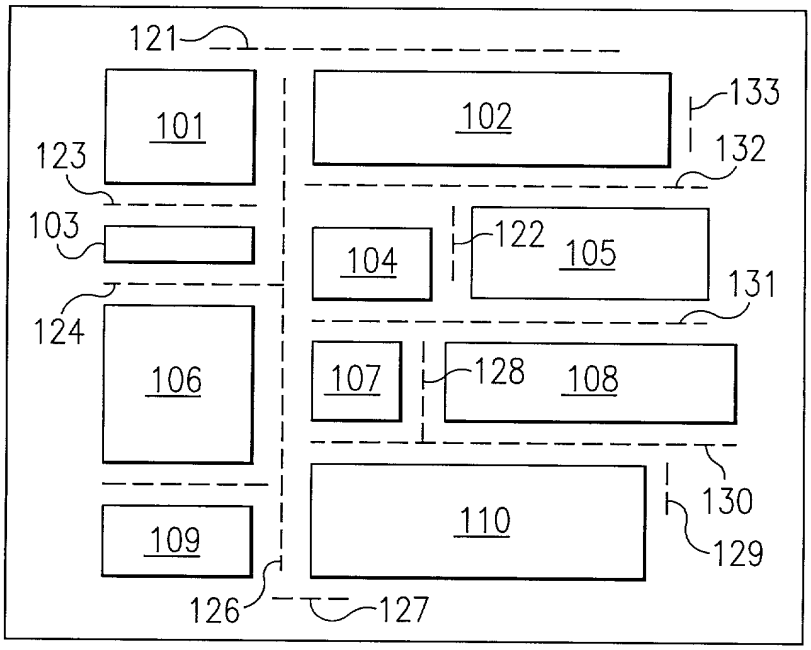


FIG. 1
(PRIOR ART)

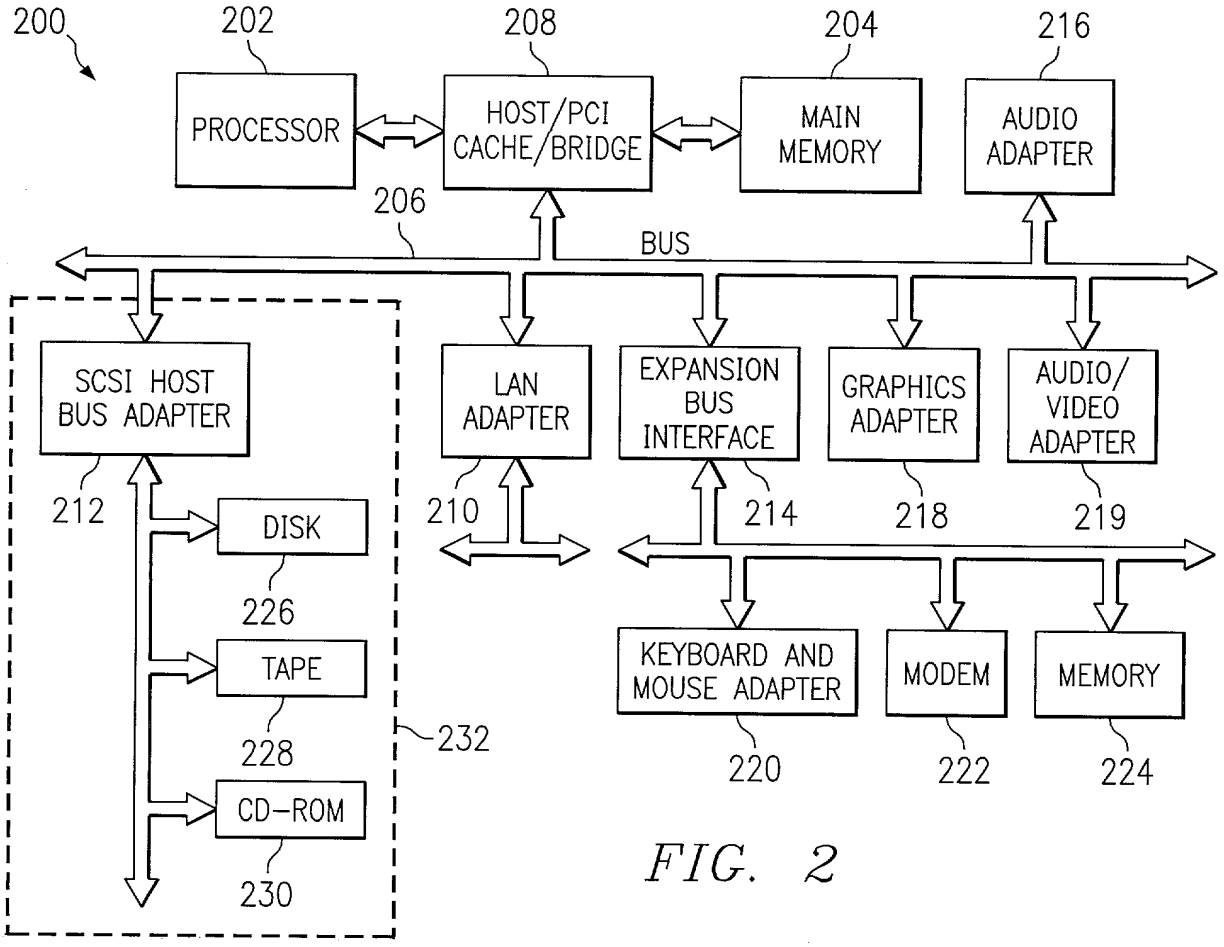


FIG. 2

FIG. 3

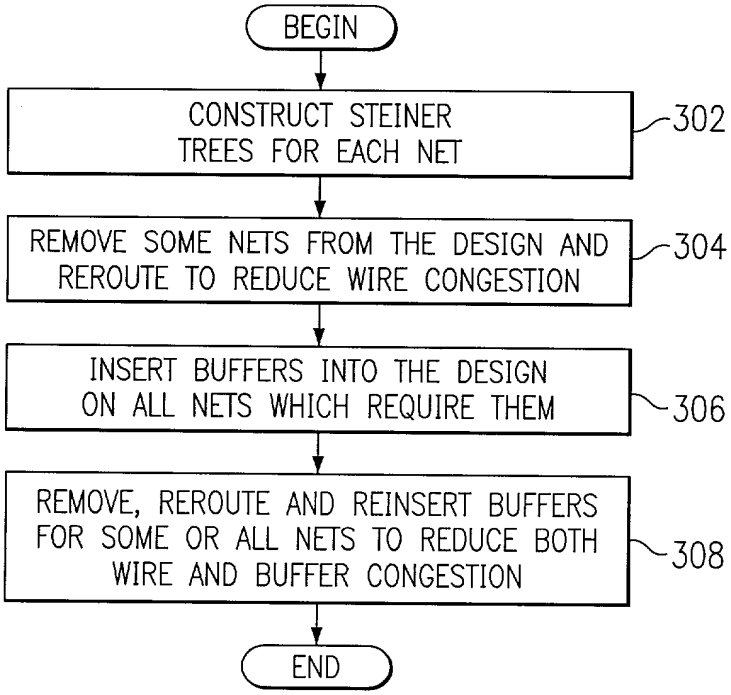
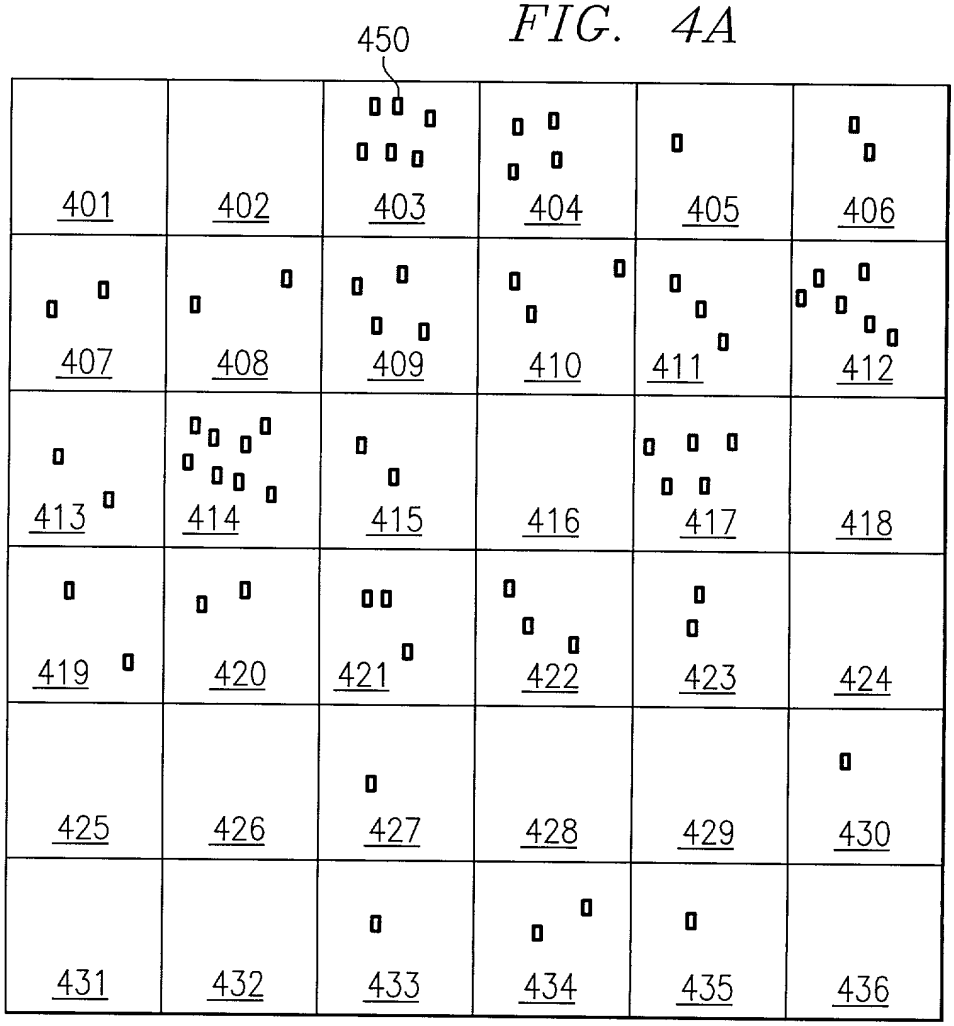

BEGIN
CONSTRUCT STEINER TREES FOR EACH NET
302
REMOVE SOME NETS FROM THE DESIGN AND REROUTE TO REDUCE WIRE CONGESTION
304
INSERT BUFFERS INTO THE DESIGN ON ALL NETS WHICH REQUIRE THEM
306
REMOVE, REROUTE AND REINSERT BUFFERS FOR SOME OR ALL NETS TO REDUCE BOTH WIRE AND BUFFER CONGESTION
308
END

FIG. 4A


450
401
402
403
404
405
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418
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420
421
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430
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432
433
434
435
436

FIG. 4B 3/8

0 401	0 402	6 403	4 404	1 405	2 406
2 407	2 408	4 409	3 410	3 411	6 412
2 413	8 414	2 415	0 416	5 417	0 418
2 419	2 420	3 421	3 422	2 423	0 424
0 425	0 426	1 427	0 428	0 429	1 430
0 431	0 432	1 433	2 434	1 435	0 436

FIG. 5

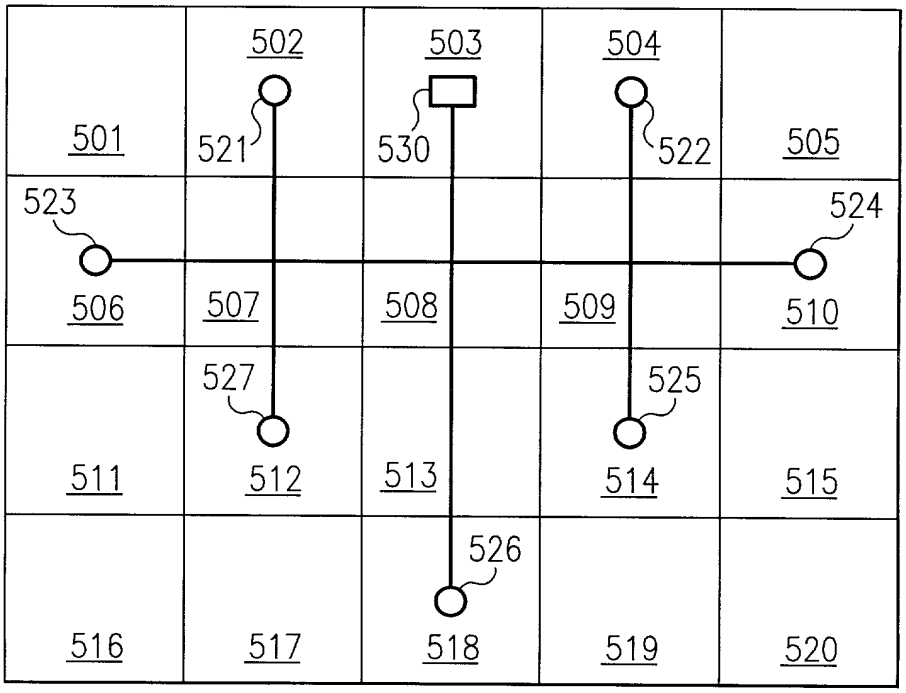


FIG. 6

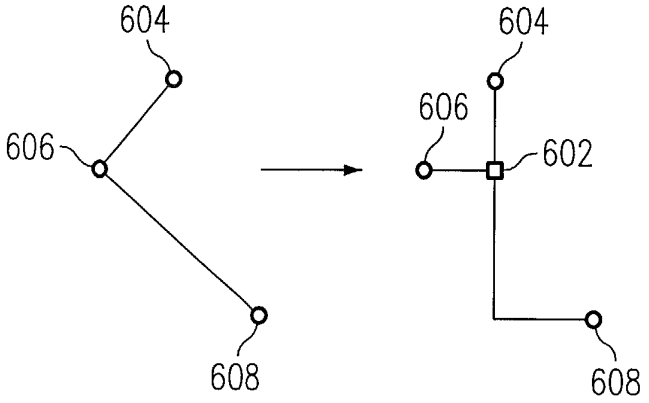
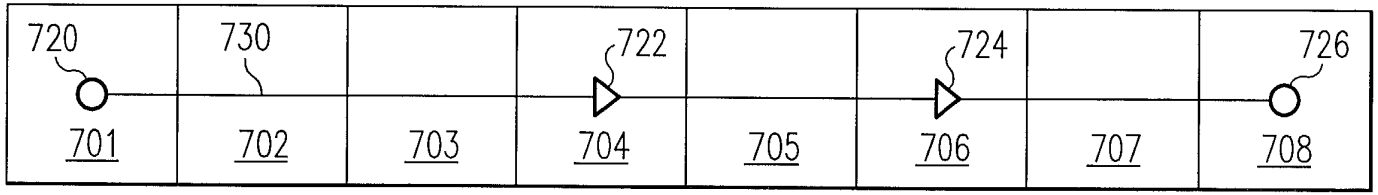


FIG. 8

1. SET $C_{t[j]} = 0$ FOR $1 \le j < L_i$ AND SINK t. SET $v=t$
2. WHILE $v \neq s$ DO
   FOR $j=1$ to $L_i - 1$ DO
   SET $C_{par(v)}[j] = c_v[j-1]$
   SET $C_{par(v)}[0] = q(par(v)) + min\{C_v[j] \| 0 \le j < L_i\}$
   SET $v=par(v)$
3. LET v BE SUCH THAT $par(v)=s$. RETURN $min\{C_v[j] \| 0 \le j < L_i\}$

FIG. 7



B(v)	8	5	12	3	5	0
b(v)	3	4	2	3	0	0
p(b)	2.5	3.6	2	0.8	4	5
q(v)	1.3	8.6	0.5	∞	1.0	∞

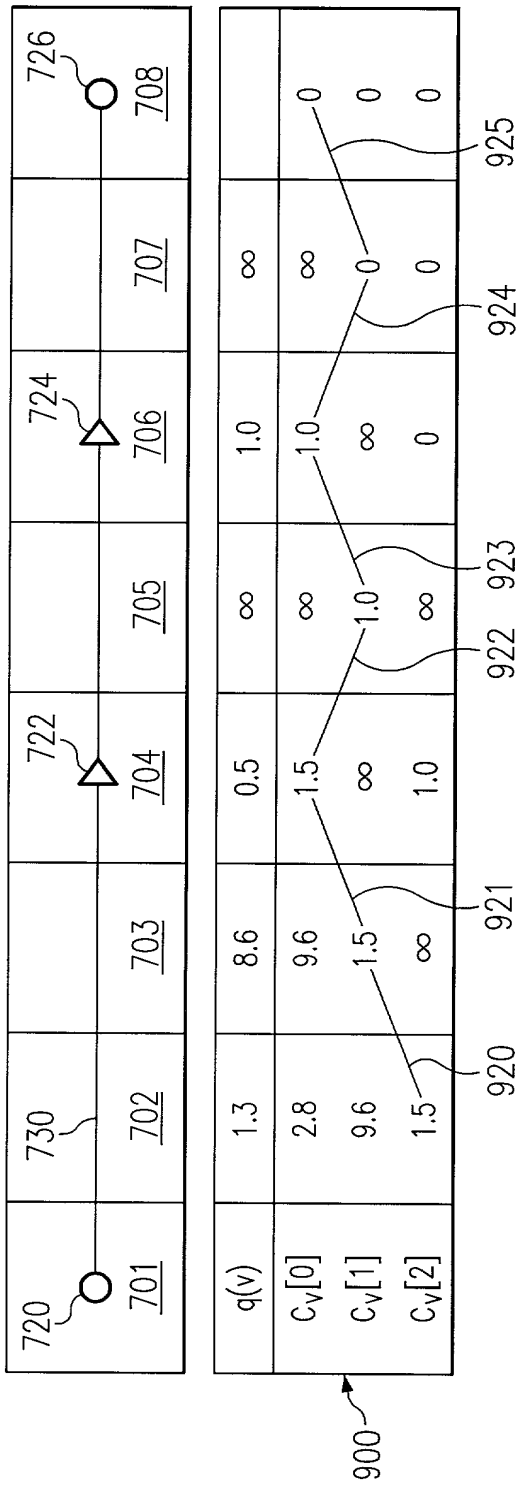

720
730
726
701
702
703
704
705
706
707
708
722
724
q(v)
$C_V[0]$
$C_V[1]$
$C_V[2]$
1.3
2.8
9.6
1.5
8.6
9.6
1.5
∞
0.5
1.5
∞
1.0
∞
∞
1.0
∞
1.0
∞
∞
0
0
0
0
0
0
0
0
900
920
921
922
923
924
925

FIG. 9

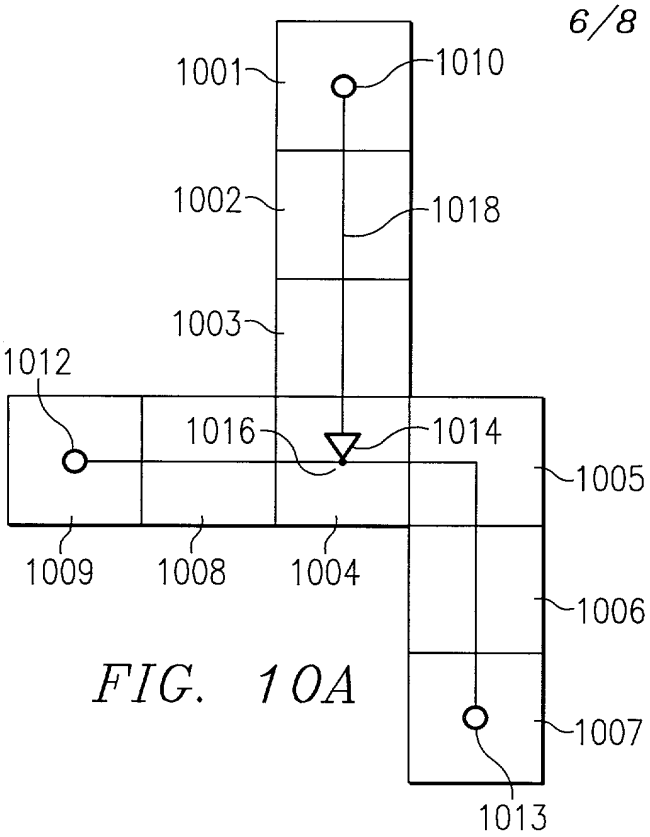


FIG. 10A

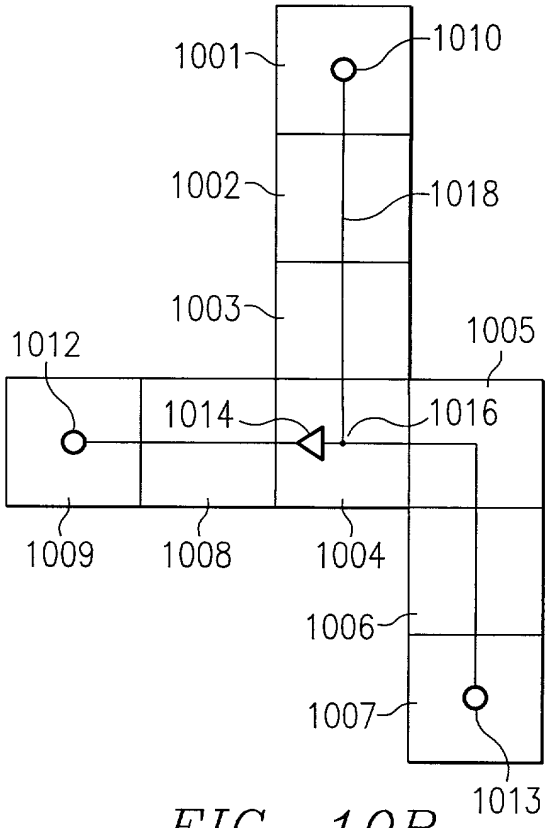


FIG. 10B

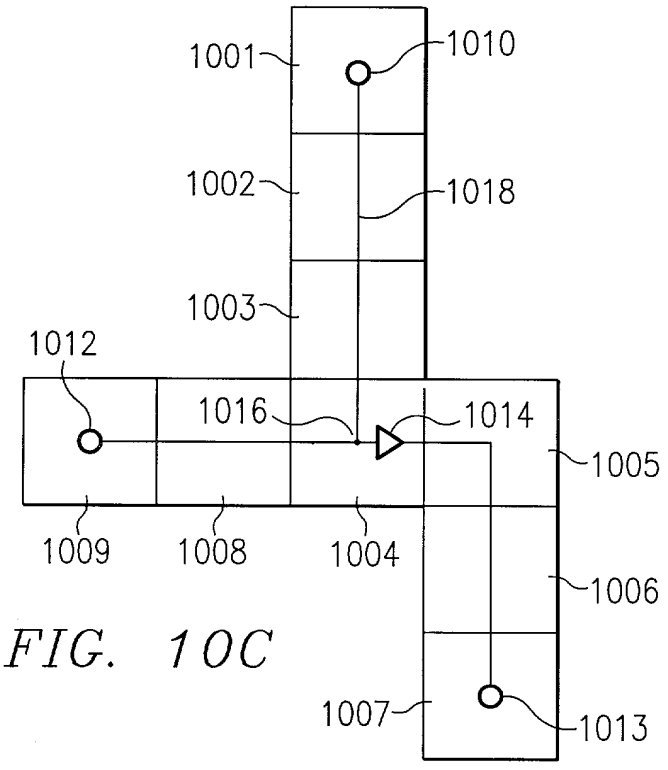


FIG. 10C

FIG. 11 1100

1. PICK AN UNVISITED NODE v SUCH THAT ALL DESCENDANTS OF v HAVE BEEN VISITED
   WHILE $v \neq s$ DO

2. IF v IS A SINK THEN
   SET $C_V[j] = 0$ FOR $1 \leq j < L_i$

3. IF v HAS ONE CHILD $l(v)$ THEN
   FOR $j=1$ TO $L_i.-1$ DO
   SET $C_V[j] = C_{l(v)}[j-1]$
   SET $C_V[0] = q(v) + min\{C_{l(v)}[j] \| 0 \leq j < L_i.\}$

4. IF v HAS TWO CHILDREN $l(v)$ AND $r(v)$ THEN

4.1 FOR $j=2$ TO $L_i.-1$ DO
   SET $C_V[j] = min\{C_{l(v)}[j_l] + C_{r(v)}[j_r] \| j_l + j_r + 2 = j\}$

4.2 SET $C_V[0] = q(v) + min\{C_{l(v)}[j_l] + C_{r(v)}[j_r] \| j_l + j_r + 2 \leq L_i\}$

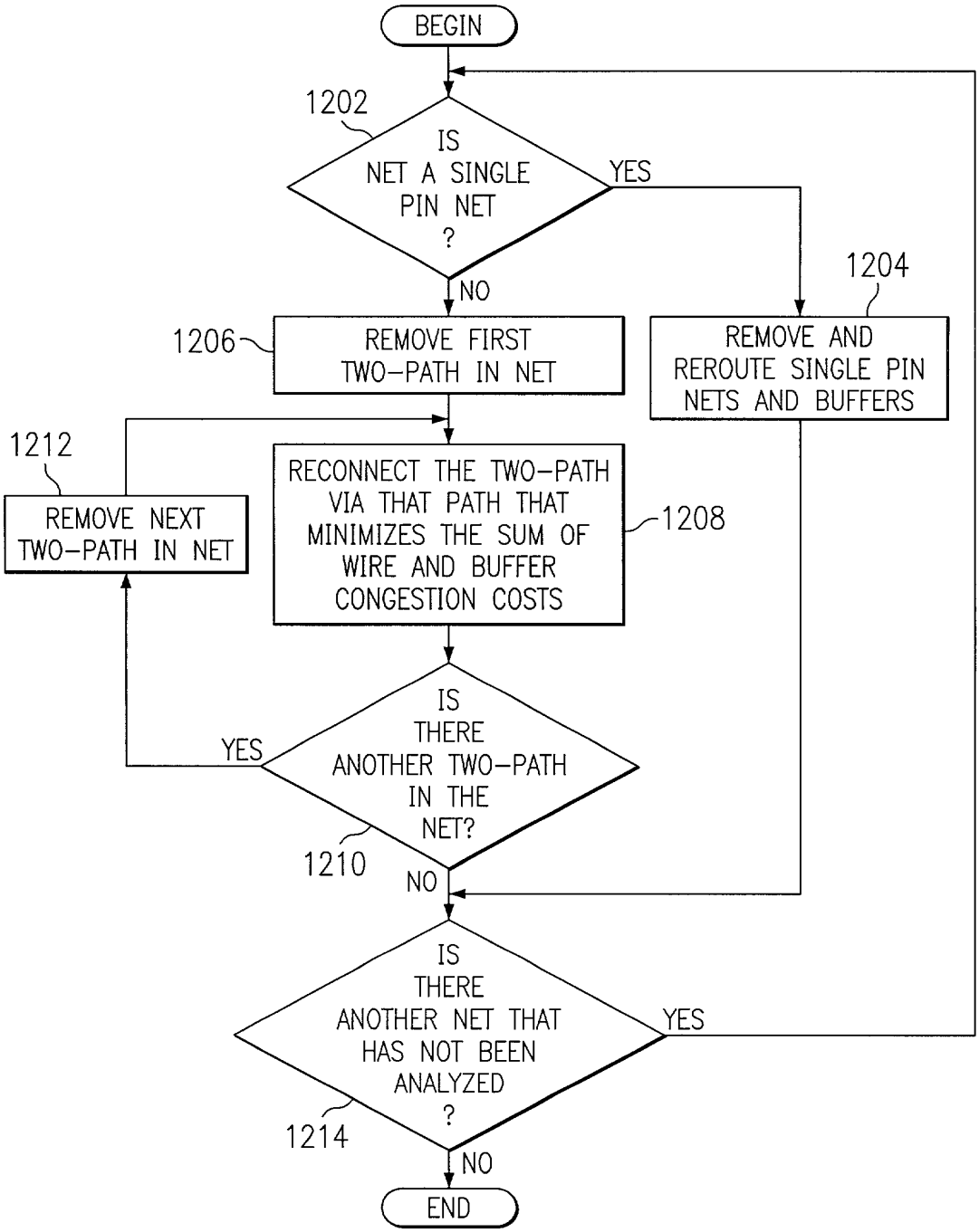
4.3 SET $C_V[1] = \infty$

4.4 FOR $j=1$ TO $L_i - 1$ DO
   SET $C_V[j] = min\{C_V[j], q(v) + C_{l(v)}[j-1], q(v) + C_{r(v)}[j-1]\}$

5. MARK v AS VISITED
   PICK AN UNVISITED NODE v SUCH THAT ALL DESCENDANTS OF v HAVE BEEN VISITED

6. RETURN $min\{C_s[j] \| 0 \leq j < L_i\}$.

FIG. 12


BEGIN
1202
IS NET A SINGLE PIN NET ?
YES
NO
1204
REMOVE AND REROUTE SINGLE PIN NETS AND BUFFERS
1206
REMOVE FIRST TWO-PATH IN NET
RECONNECT THE TWO-PATH VIA THAT PATH THAT MINIMIZES THE SUM OF WIRE AND BUFFER CONGESTION COSTS
1208
1212
REMOVE NEXT TWO-PATH IN NET
IS THERE ANOTHER TWO-PATH IN THE NET?
YES
1210
NO
IS THERE ANOTHER NET THAT HAS NOT BEEN ANALYZED ?
YES
1214
NO
END